Day 245 **A Tier 10-a-day: Model Solutions**

1 Exchange rates

£1 = €1.35.
(a) Change £220 to euros.
(b) Change €243 to pounds.

(a) 220 × 1.35 = 297
(b) 243 ÷ 1.35 = 180
Answer: (a) €297 (b) £180

2 Area of a sector

The diagram shows a sector of a circle of radius 14 cm.
Work out the area of the sector.
Give your answer in terms of π.
The diagram is not drawn accurately.

Area = $\frac{60}{360} \times \pi \times 14^2$

$= \frac{1}{6} \times 196\,\pi$

$= \frac{98}{3}\pi$

Answer: $\frac{98}{3}\pi$ cm^2

3 Percentages in context

Priya earns £16000 a year.
She pays no tax on the first £10000.
She pays 20% tax on the rest.
Work out how much tax she pays in a year.

Taxable amount = £16000 − £10000 = £6000
Tax = 20% of £6000 = £1200
Answer: £1200

4 Solving quadratic equations

Solve $3x^2 - x - 4 = 0$

Factorise: $(x + 1)(3x - 4) = 0$
$x + 1 = 0$ or $3x - 4 = 0$
$x = -1$ or $x = \frac{4}{3}$
Answer: $x = -1$ or $x = \frac{4}{3}$

5 Finding a percentage change

The number of visitors to a museum was 120 and is now 114.
Work out the percentage decrease.

Change = 120 − 114 = 6
Percentage decrease = $\frac{6}{120} \times 100 = 5\%$
Answer: 5% decrease

6 Enlargements and coordinates

Shape A has an area of 14 cm^2.
Shape A is enlarged by scale factor 5 to give shape B.
Work out the area of shape B.

Area scale factor = $(5)^2 = 25$
Area of B = 14 × 25 = 350
Answer: 350 cm^2

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7 Double inequalities

(a) Solve $16 < 5x + 6 < 46$
(b) Write down all the integer values of x that satisfy this inequality.

(a) Subtract 6 from every part: $10 < 5x < 40$
Divide every part by 5: $2 < x < 8$
(b) The integers are 3, 4, 5, 6, 7
Answer: (a) $2 < x < 8$ (b) 3, 4, 5, 6, 7

8 Reading a histogram

The histogram shows information about the mass of some items.
(a) Work out the number of items with a mass in the class 0 to 10 g.
(b) Work out an estimate for the number with a mass greater than 35 g.

(a) Frequency = frequency density × class width
0.4 × 10 = 4
(b) 35 to 50: 1.6 × 15 = 24
Class 50 to 80: 0.8 × 30 = 24
Total = 24 + 24 = 48
Answer: (a) 4 (b) 48

9 Bounds of a speed or density

A metal block has mass 320 g and volume 153 cm^3. The mass is measured to the nearest 10 grams and the volume to the nearest cm^3. (Calculator)
Work out the lower bound for the density of the metal in g/cm^3.
Give your answer correct to 3 significant figures.

density = mass ÷ volume
For the lower bound of density use the lower bound of mass and the upper bound of volume.
315 ÷ 153.5 = 2.05212
= 2.05 g/cm^3 (3 s.f.)
Answer: 2.05 g/cm^3

10 Perpendicular bisector

A is the point (5, 4) and B is the point (3, −4).
Find the equation of the perpendicular bisector of AB.

Midpoint of AB = $(\frac{5+3}{2}, \frac{4+(-4)}{2}) = (4, 0)$

Gradient of AB = $\frac{-8}{-2} = 4$

Perpendicular gradient = $-1 \div 4 = -\frac{1}{4}$

$y = -\frac{1}{4}x + c$ through (4, 0): $0 = -\frac{1}{4} \times 4 + c$, so $c = 1$

$y = -\frac{1}{4}x + 1$

Answer: $y = -\frac{1}{4}x + 1$